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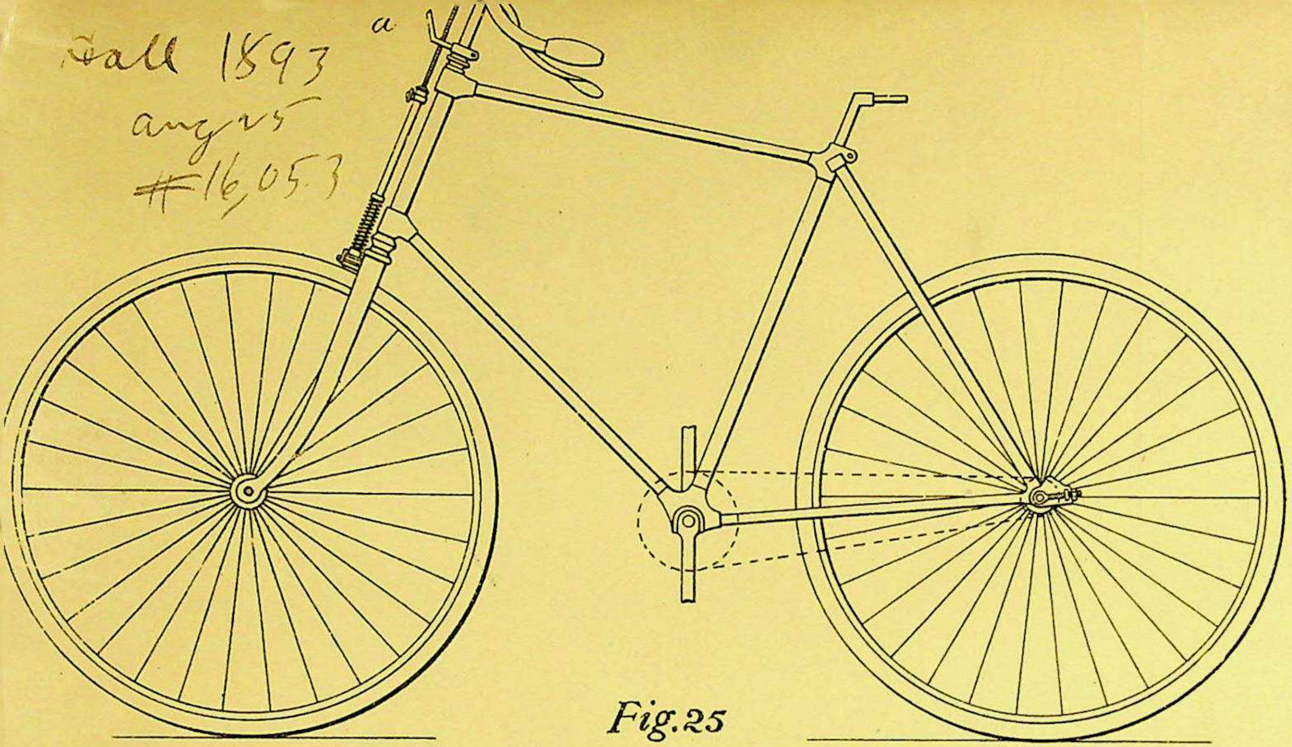
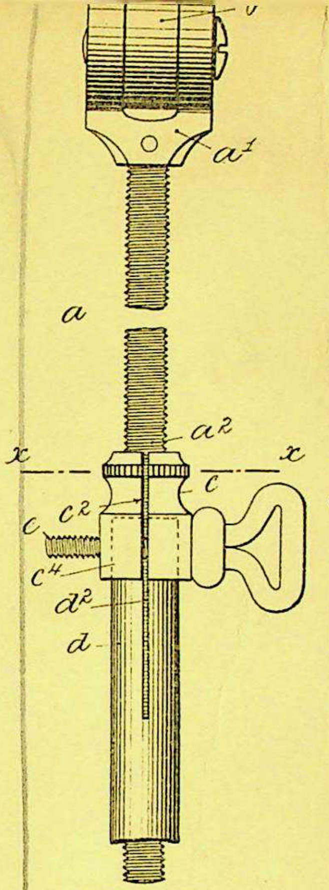




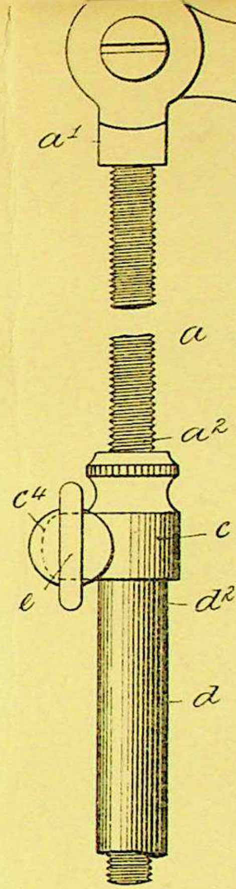


Fig. 25

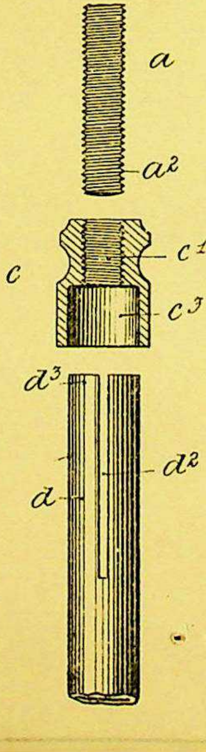


Fig. 23

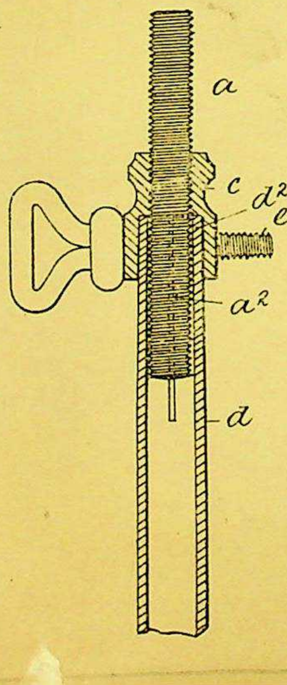


Fig. 24

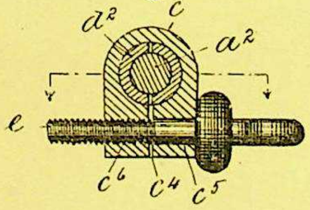


Fig. 28

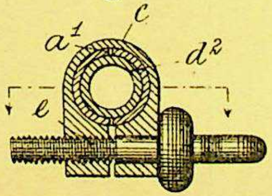


Fig. 26

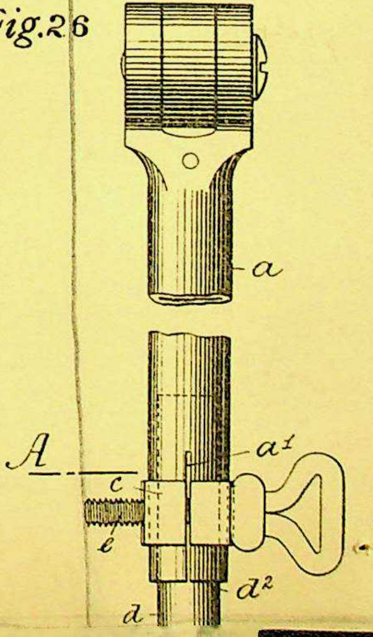
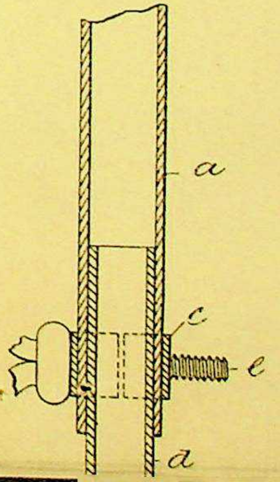


Fig. 27



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N° 16,053 A.D. 1893

Date of Application, 25th Aug., 1893
Complete Specification Left, 25th May, 1894—Accepted, 28th July, 1894

PROVISIONAL SPECIFICATION.

Improvements in and in the Manufacture of Parts of Cycles and their Accessories.

I, Robert Frederick Hall, of the R. F. Hall Manufacturing Company Limited, of Sampson Road North, Sparkbrook, in the City of Birmingham, Manufacturer, do hereby declare the nature of this invention to be as follows:—

This invention relates to detail improvements in, and in the manufacture of, some of the component parts of cycles and their accessories, and consists, in the first part, in improvements in the construction, arrangement and fitting of the pedals; in the second part, in a new construction of combined rat-trap and rubber pedals; in the third part, in dust proof pedals; in the fourth part, in brake or brake rod adjustments; in the fifth part, in the manufacture of chain; in the sixth part, in attachable and detachable means in connection with mud-guards; in the seventh part, in the chain adjustment means at the ends of the back fork; in the eighth part, in inflators or air pumps, and in the ninth part, in spanners to be used with the said cycles.

In carrying out one part of my improvements in connection with pedals, I cut out the end or pedal plates from thin sheet steel or other metal, with the horns of the same directed from the two opposite sides of the middle and body part, which is centrally pierced with holes to receive the ball bearing cups, each consisting of an inside ball race or bush, open at its outer end, and having at its other end, a collar or flange which comes upon the inside back of the middle part of the pedal plate, and with the inner end of the said cup taking over the end of the tube of the covered centre. Thus each of the cups, which are made separate from the covered centres, and separate from the pedal plates, consists of a hollow and flanged attachment, contracted or reduced internally about its middle, forming as it were two end chambers, the one forming the ball bearing race, and the other adapted to receive an end of the tube constituting the covered centre.

The fore and barrel part of the said cupped attachment extends forwardly through the hole in the pedal plate, and with the collar or flange coming at the back of the same, whilst a neck, inward of the flanges, takes over the end of, and comes flush with, the tube of a covered centre.

The said component parts are either affixed by a closing process or processes or by brazing or otherwise.

In carrying out my improvements in connection with the treads of pedals, so as to utilize the entire breadth of the rubber or tread surface employed, instead of using the entire breadth between the pedal plates, I only employ a portion of the breadth between the horns of the pedal plates.

Thus, the pedal plates or the end plates of the pedal have their outer parts cranked inwards, so as to reduce the length of the tread surface, or the distance between the outer parts of the said end plates.

Thus, the end plates have their outer portions brought inwards to such an extent that the rubber or rat-trap surface coming between them is entirely utilized as the tread, instead of leaving end portions upon which the foot never comes.

This reduction of the length of the tread by the cranking or bringing inwards of the ends or the bracket ends is an advantage in respect to lessening the weight of the pedals and to the use therewith of a minimum of rubber or other material.

In carrying out a further form of my invention in connection with pedals having rubber treads, I employ a pedal body and pedal plates of the construction as herein described, or of any other suitable construction, and I affix the rubber treads

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between longitudinally directed clamping plates consisting of two strips of metal, preferably with outside beaded edges, and inside flat parts, which are brought together with the web of a T sectioned rubber tread coming between them, and with the ends of the said strips united to the pedal plates or the returned ends of the pedal plates by rivetting or otherwise.

Now the rubber treads upon each side of the pedals are formed from T-sectioned rubber, with the heads of the same coming upon the top and bottom edges of the clamping plates, and with the webs of them coming between and being held by the plates, or the rubber of both sides may be made in a piece, and of the section of a double headed rail or a double headed T.

Or the tread frame plates may be made in cross section alike unto an H-sectioned girder, with the top webs forming the rests for the rubber, which have expanded bases, over which the edges of the metal of the frame are turned.

I propose that the sections of the rubber should be longitudinally channelled upon the tread surfaces, so as to reduce the weight of the same, whilst possessing a maximum of tread surface.

As a further form of my invention, the said rubber-tread-gripping plates or frames may be made of two parts, or of two plates, with their ends made hook section, so that when the same are brought together, rubber treads are supported and held between the said ends, whose hook formations are turned inwards.

In carrying out a further improvement in connection with combined rubber and rat-trap pedals, I make the sides up of two longitudinally disposed plates, between which, upon one edge, a web or the attachment part of a rubber tread is held and clamped by the bringing of the said plates together with the rubber between them, whilst the other edge, which is extended downwards or upwards relative to the axis of the pedal, has rat-trap teeth cut or fashioned from out of it.

By producing pedals as described, considerable economy is effected in the manufacture of the same, besides which, the weight of the article is considerably reduced, which is now an important factor in cycle fittings.

The clamping plates of the rubber treads may be made from drawn metal, with hollow headed edges or the like, and which said plates may be ribbed, and so also the sheet metal end plates may be embossed to make the same acquire the greatest possible strength with a minimum of metal.

Although I have described that the last named building up of the treads is particularly applicable to pedals with one side rat-trap and the other rubber, yet the same principle of construction may be applied where both sides are required to be fitted with rubber or having rat-trap treads.

In carrying out the production of a dust-proof pedal according to the third part of my invention, I provide and fit over the open ends of the cups of the ball races, and over the cones, caps, having inside diameters equal to the outside diameters of the necks of the cups, and with D shaped middle piercings taking upon like D sectioned parts of the spindles, so that the dust-proof caps, which take over and hood or cover up the ends of the ball races and the cognate parts working within them, remain stationary relative to the spindle.

In carrying out the brake adjustment means, hereinbefore referred to as constituting the fourth part of my invention, the brake rod, or the lower end of the brake rod, (to the upper end of which the brake lever is jointedly connected) is wormed, and takes through an adjusting screw nut or screw box having a milled head and neck or body part, and which latter takes and is fitted within the upper end, which is split, of a brake tube, circumferentially embraced by a clip, closed by a screw pin or equivalent.

The lower end of the brake tube has fitted to it, the brake block, spoon or other wheel retarding means. Thus, the elements employed in connection with the adjustable means as aforesaid, consists of a screwed brake rod, taking through an adjustable nut, which is clamped within the plain and split upper end of a brake tube.

Now assuming that an adjustment is required to be made in the brake, first loosen the clamping band by the unscrewing of the pin, when the nut or screw box is released.

Now rotate the screw box upon the wormed part of the brake rod to the desired extent relative to the necessary adjustment. Then place the nut with the rod in the split end of the brake tube, when by the drawing-to of the clip, the split sectional parts of the end of the tube is then drawn upon the nut or screw box, which is clamped in position, and a positive adjustment thereby made.

In the driving chain, as comprehended under the fifth part of my invention; this relates to the rivet parts of the said chain, and has for its object, the hardening of the whole of the said rivets less those parts requiring to be left malleable or soft for rivetting, that is to say, this part of my invention consists in leaving malleable or soft, end portions of hardened steel rivets, thus dispensing with the use of hardened steel bushes, as now employed.

By my invention, the wearing properties of the rivets are greatly increased, and the same, when fitted, are prevented from rotating.

In carrying out the process of leaving soft or malleable portions of the said rivets, I subject the whole of them, less those portions which are to be left soft or malleable, to the action of heat or flame, and with those parts to be left soft protected by a screen or shield, and when the parts to be hardened are sufficiently heated, the same are immersed in a suitable liquid, hence the hardening, with those portions not brought under the action of the heat or flame left intact, or malleable or soft.

I prefer to effect the heating by flame jets, with or without blast.

The ends thus left soft or malleable are shouldered or cross faceted or squared, which ends take into like shaped holes in the chain links, by which squaring up of the ends, the said rivets having entire hardened bodies, are prevented from rotating.

In carrying out the sixth part of my invention in connection with attachable and detachable mud guards or other loose framings, which at times it may be desirable to remove when not required to be used, I employ in connection with the said mud-guards or the like, detachable clips.

Thus, in applying this part of my invention in connection with the mud guard of a back wheel, I provide the back framing, or the back of a diamond framing, which is composed of two sides, coming together, but having a distance between them greater than the breadth of the wheel and of the mud guard, with cross struts or cross ties, consisting essentially of bars, around which, attachment clips, as hereinafter described, carried by the mud guard, come.

Thus the members of each side of the framing or the back stays, the one directed obliquely from the bottom bracket, and the other from the seat, and both terminating at the same point at the rear, are provided at points between the said sides, with cross struts.

Now the guards are fitted with attachment clips, each consisting of a horse-shoe-shaped strip-steel clip, with the ends made solid, and wherethrough a drawing-up screw pin passes. The crowns of the said clips have ears or flanges for the attachment of the said clip to the inner side of the mud guard, or to the stays of the same at suitable points.

The attachment band clips are preferably made from cruciform blanks, subsequently fashioned into the desired clip form.

In affixing a mud guard, place the clips around the struts or cross ties coming between the frame members, or around the frame members themselves. Then pass the screw through the terminal ends of the band clip, and screw the same home, when the necessary attachment is made.

In carrying out the seventh part of my invention relating to the chain adjustment means at the ends of the back forks, I fit both sides of the said back forks with adjustment means, each consisting of a propelling and repelling screw, terminated at its inner end by a spindle bearing or a ring wherethrough the spindle passes, and with the inner end of the said bearing ring or plate having ribs, lugs or feathers, which take within longitudinal channels or grooves, disposed upon or directed along the branched members of the forks, which have lugs adapted to take within the lower ends of the lower bracket stay members and the seat stay members.

By the lugs on the bearings taking and sliding within the channels or grooves directed along the sides as aforesaid, the branches are prevented from opening out.

Fitted within the ends of the said branches are cross bars, having plain bearings or eyes through their middles, wherethrough the adjustment or tightening-up screws pass, and at the back of it, the adjustment nuts or screw turns taking upon the ends of the said screws abut and take their bearings.

In carrying out the eighth part of my invention relative to pneumatic tyre inflators, which are carried by, and form an accessory to, a machine, I provide the said instrument with a means for preventing the inner tube from coming out of the outer one, or the outer one from over the inner one, or the rod, where one is employed, from coming out of the pump.

The said means may consist of a turn-down catch, spring catch or detent, or a screw turn, which ties or connects the one part to the other, or otherwise prevents the one part from moving within or over the other part, when the inflator is out of use.

In one form of my invention the pump may be constructed and arranged as follows :—

I take an ordinary barrel or cylinder, and fit the interior of the same with a reciprocating and double-headed piston, or a double piston separated by a rack-toothed stalk or rod, with the teeth of which, a pinion on the axis of a toothed wheel engages. Also alternately intergearing with the said toothed wheel are two shifting pinions, which respectively alternately intergear with a pinion or toothed wheel upon an axis, to which an arm, lever or winch handle is connected.

The first named toothed wheel is provided with a stud upon its face, or projecting from its periphery beyond and without the plane of its teeth, and the said stud is for the purpose of throwing the shifting pinions alternately into and out of gear on each reciprocation of the double piston.

Directed from both ends of the pump barrel are passages leading to a supply connection fitted with a valve or valves common to them both. One end of the barrel is fitted with a loop or ring, whilst the foot and lower end has a resting foot or spike.

Now by rotating the crank or winch handle after the manner of a windlass, motion is imparted to the pistons through one or other of the shifting pinions, the toothed wheel, the rack pinion and the rack.

In carrying out a further form of my invention in connection with power-working inflators, I provide, as before, the barrel casing with two pistons or two piston heads, separated from each other, and connected together by a reciprocating slide having a row of stud teeth directed up its middle alike unto a Mangle rack, and surrounding these said stud teeth is a continuous groove or path, in which the bearing end of a pinion (operated by a lever, winch handle or its equivalent,) which engages with the rack studs, takes.

The slide which carries the rack and the pistons has rollers at its ends, so as to reduce the frictional contact between the moving parts and the inside of casing.

I propose also to provide the studs of the rack teeth with rollers also to reduce friction, and the outer end of the axis of the pinion with a suitable fixed bearing, so that on the pinion being rotated through the lever or handle, the slide is reciprocated, and with it the piston ends, whilst the groove or path surrounding the rack teeth is continuously drawn or moved over the inner end of the pinion axis, and on the end studs of the rack completing their traverse, the axis of the pinion then traverses from one side of the rack to the other, and this may be accomplished by the bearing of the pinion being made resilient or to work in a slot having springs at the two ends, so as to admit of the pinion first operating upon one side of the rack, and then on the other, by the lateral sliding of the said pinion at the end of each traverse.

In a further form of this part of my invention, the studs may be arranged to take a course after the fashion of an endless band, that is an endless row of studs with the path coming in a continuous manner within the inside of them and surrounding a middle rib.

By rotating the lever, the pinion, by a continuous rotation reciprocates the slide and pistons, and on the completion of each traverse, the said pinion is transferred from one side of the rack to the other, whether the same works inside or outside of the rack.

The outlet pipes at the ends of the casing lead to a common delivery.

In carrying out my invention of the ninth part in connection with the production of spanners for cycles, I make the handle and fixed jaw parts up of two longitudinal and hollow sectional parts, which, when brought together, with the hollow of the one part adjacent to and coincident with the hollow of the other part, form a flattened tubular-like spanner body part with fixed jaw, on the rivetting together of the said halves or longitudinal sectional parts.

That part of the said flat tubular-shaped hollow body part is open about its middle, down which, or within which, the shank of the movable jaw works, whilst the lower end is wormed, upon which a screw box or screw nut fitted and working through a piercing cut within the middle part of the spanner engages, so that by rotating the said nut, it extends slightly beyond the outside walls of the sides as aforesaid, the movable jaw is propelled and repelled, and the distance between the jaws thereby adjusted.

In carrying out a further form of my invention in connection with folding spanners having fixed heads, I take two sectional parts or sides, and connect the same together by rivetting or otherwise, and pivot to the one end of the same, one, two three or more spanner arms surmounted by heads having hexagonal middle piercings suitable for taking upon varying sized nuts.

These said spanner heads or parts are cut out from sheet metal and turn or pivot fanlike upon a common axis near one end of the handle or holder, and which end has a stop against which the said spanners take a bearing when straightened out.

I may also pierce the middle or an enlarged inner end of the handle with a hexagonal piercing for taking upon a nut.

The sides of the handle part of the fold-up compound spanner are kept at even distances apart by distance pieces or hollow sleeves wherethrough affixing rivets pass.

Dated this 24th day of August 1893.

ROBERT FREDERICK HALL,
By Henry Skerrett,
Agent for Applicant.

COMPLETE SPECIFICATION.

Improvements in and in the Manufacture of Parts of Cycles and their Accessories.

I, Robert Frederick Hall, of the R. F. Hall Manufacturing Company Limited, of Sampson Road North, Sparkbrook, in the City of Birmingham, Manufacturer, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to detail improvements in, and in the manufacture of, some of the component parts of cycles and their accessories, and consists, in the first part, in improvements in the construction, arrangement and fitting of the pedals; in the second part, in a new construction of combined rat-trap and rubber pedals; in the third part, in dust proof pedals; in the fourth part, in brake or brake rod adjustments; in the fifth part, in a treatment of a component in the manufacture of chain; in the sixth part, in attachable and detachable means in connection with mud-guards; in the seventh part, in the chain adjustment means at the end of the back fork; in the eighth part, in inflators or air pumps and in the ninth part, in spanners to be used with the said cycles.

In carrying out my improvements in connection with pedals, I cut out the end or pedal plates from thin sheet steel or other metal, with the horns of the same directed from the two opposite sides of the middle and body part, each of which is centrally pierced with a hole to receive the ball bearing cups, each consisting of an inside ball race or bush open at its outer end, and having at its other end, a collar or flange which comes upon the inside back of the middle part of the pedal plate, and with the inner end of the said cup taking over the end of the tube of the covered centre. Thus each of the cups, which are made separate from the covered centres, and separate from the pedal plates, consists of a hollow and flanged attachment, contracted or reduced internally about its middle, forming as it were two end chambers, the one forming the ball bearing race, and the other adapted to receive an end of the tube constituting the covered centre.

The fore and barrel part of the said cupped attachment extends forwardly through the hole in the pedal plate, and with the collar or flange coming at the back of the same, whilst a neck, inward of the flanges, takes over the end of, and comes flush with, the tube of a covered centre.

The said component parts are either affixed by a closing process or processes or by brazing or otherwise.

To utilize the entire breadth of the rubber or tread surface of pedals employed, instead of using the entire breadth between the pedal plates, I only employ a portion of the breadth between the horns of the pedal plates.

Thus, the pedal plates or the end plates of the pedal have their outer parts cranked inwards, so as to reduce the length of the tread surface, or the distance between the outer parts of the said end plates.

Thus, the end plates have their outer portions brought inwards to such an extent that the rubber or rat-trap surface coming between them is entirely utilized as the tread, instead of leaving end portions upon which the foot never comes.

This reduction of the length of the tread by the cranking or bringing inwards of the ends or the bracket ends is an advantage in respect to lessening the weight of the pedals and to the use therewith of a minimum of rubber or other material. In connection with pedals having rubber treads, I employ a pedal body and pedal plates of the construction as herein described, or of any other suitable construction, and I affix the rubber treads between longitudinally directed clamping plates, consisting of two strips of metal, preferably with outside beaded edges, and inside flat parts, which are brought together, with the web of a T sectioned rubber tread coming between them, and with the ends of the said strips united to the pedal plates, or the returned ends of the pedal plates, by rivetting or otherwise.

Now the rubber treads upon each side of the pedals are formed from T or Y sectioned rubber, with the heads of the same coming upon the top and bottom edges of the clamping plates, and with the webs of them coming between and being held by the plates, or the rubber of both sides may be made in a piece, and of the section of a double headed rail or a double headed T.

Or the tread frame plates may be made in cross section alike unto an H-sectioned girder, with the top webs forming the rests for the rubber which have expanded bases, over which the edges of the metal of the frame are turned.

The sections of the rubber may be longitudinally channelled upon the tread surfaces, so as to reduce the weight of the same, whilst possessing a maximum of tread surface.

The said rubber-tread-gripping plates or frames may be made of two parts, or of two plates, with their ends made hook section, so that when the same are brought together, rubber treads are supported and held between the said ends, whose hook formations are turned inwards.

Figure 1 of the accompanying drawings represents a cycle pedal, with the same constructed, or with parts constructed and made, according to one part of my invention.

Figure 2 represents an edge view of the same, showing the clamping cheeks or plates between which the rubber cheeks are held and gripped.

Figure 3 is a cross section of Figure 1 upon the dotted lines x—x.

Figure 4 represents an end elevation of the said pedal.

Figure 5 represents an edge view of one of the end pedal plates separately.

Figure 6 represents a front elevation of the same, whilst

Figure 7 represents an elevation of the blank from which the said pedal plate Figures 5 and 6 is made, and

Figure 8 represents an edge view of the shaped side plate.

Figure 9 shows a section of one of the rubber treads, before the same is gripped between the clamping plates or holding cheeks shown separately and in section in Figure 10, and in front elevation of one of them in Figure 11.

Figure 12 shows a section and front elevation of the ball bearing cup separately.

In Figures 1 to 12, a are end pedal plates, cut out from thin sheet steel or other sheet metal, having horns a^1, and with the middle part of each of the said plates pierced with holes a^3, to receive the ball-bearing cups b, each having a ball-bearing race b^1, a bush or neck b^2, stepped on its outer side at b^3, and a collar b^4, which latter comes upon the inside back of the sunken inside middle part a^4, of the pedal plates a.

c is a tube or covered centre, whose open ends come between the ball-bearing cups b, and take upon the stepped ends b^3.

Each of the sides d, of the pedal is made up of opposed side cheeks, strips or plates d^1, d^1, between the hook-shaped top and bottom edges d^2, of which, the shanks e^1, of the rubber treads e, are gripped and held, on the said plates being connected together by rivets d^3, or otherwise. The rivets or means of connection are made to unite both the gripping plates d^1, together and also the end pedal plates, by the said rivets taking through the ears a^5, which come between the ends of the opposed faces of the side plates d^1, d^1, whilst the said plates are confined to set positions by ear stops a^6, directed outwardly from the sides of the pedal plate ends a.

It will be thus seen that the whole of the component parts of the pedal are made interchangeable, and that the same when fitted, are conjointly held together by the sides of the pedal, which, besides taking the function of ties, constitute carriers and grips for the rubber treads.

Although I have represented rivets as the means of connecting the sides to the ends, yet equivalents, such as screw pins, cottars, metal bulgings or the like, may be employed in their stead.

It will be obvious that by the cranking-in of the end pedal plates, that the normal breadth of the tread is contracted to the actual width of the tread of the foot, without diminishing the distance between the bearings.

Instead of employing side plates or cheeks d^1, of the section as shown, I may employ flat plates, or plates with only the upper portions of the same turned over, so as to make a better grip, and the connection of the rubber treads may be made by making the said treads e, of the section as represented, and sliding their foot ends e^1, into the undercut space embraced between the turned over top and bottom edges d^2, of the plates d^1, or the shanks of the rubber treads may be made straight or plain, and the edges d^2, of the plates may be turned inwards and made to imbed themselves into the opposite sides of the rubber, for holding them, by a press or by tools.

In a further form of my invention in connection with combined rubber and rat-trap pedals, I make the sides up of two longitudinally disposed tie plates, between which, upon one edge, a web or the attachment part of a rubber tread is held and clamped, by the bringing of the said plates together, with the rubber between them, whilst the other edge, which is extended downwards or upwards relative to the axis of the pedal, has rat-trap teeth cut or fashioned from out of it.

By producing pedals as described, considerable economy is effected in the manufacture of the same, besides which, the weight of the article is considerably reduced, which is now an important factor in cycle fittings.

The clamping plates of the rubber treads may be made from drawn metal, with hollow beaded edges or the like, and which said plates may be ribbed, and so also the sheet metal end plates may be embossed, to make the same acquire the greatest possible strength with a minimum of metal.

Although I have described that the last named building-up of the treads is particularly applicable to pedals with one side rat-trap and the other rubber, yet the same principle of construction may be applied where both sides are required either to be fitted with rubber, or to have rat-trap treads only.

Figure 13 represents a pedal made according to one part of my invention, with one side provided with rubber treads and the other with rat-trap.

Figure 14 represents a side elevation of the said pedal, whilst Figure 15 represents an edge view and an elevation of one of the side and tie plates separately.

The pedal plate ends are united to the sides in the same way as already described and represented.

a are the end pedal plates, *b* the ball-bearing cups, *c* is the covered centre and d^1 the side and tie plates of the sides *d*, with the one edge formed into rat-trap teeth d^6, whilst the other edge d^2, is made to clamp or receive the foot or shank end e^1, of the rubber tread *e*.

I wish it to be understood that I do not limit myself to the cross-sectional shape of the plates, as the same may be varied without departing from the nature of this part of my invention, which is a combined and reversible rubber and rat trap pedal, nor do I confine myself to the section of the rubber treads, as these also may be varied to suit the kinds of side plates employed.

Figure 16 represents a pedal with rubber treads upon two opposite sides of one edge, and a rubber tread and a rat-trap tread upon the two opposite sides respectively of the other edge.

In making a dust-proof pedal according to a part of my invention, I provide and fit over the open ends of the cups of the ball races, and over the cones, caps, having inside diameters equal to the outside diameters of the necks of the cups, and with D shaped middle piercings taking upon like D sectioned parts of the spindles, so that the dust-proof caps, which take over and hood or cover up the ends of the ball races and the cognate parts working within them, remain stationary with the spindle.

Figure 17 represents a dust-proof pedal with the end part of the spindle in section.

Figure 18 represents a section and a front elevation of the cap.

Figure 19 represents a part horizontal section of the said pedal, showing the position of the cap relative to the ball bearing fittings and cone.

a are the end pedal plates, *b* is the ball bearing race, *c* is the covered centre, *d* are the sides, *h* is the spindle, *i* the cone taking upon the end of the spindle, and *j* is a cup for covering up the joints of the fitted together parts, to prevent the ingress of dirt to the ball bearings *k*. *m* is a nut taking upon the end of the spindle, outward of the cap *j*, and *n* is an interposed washer.

In the brake adjustment means, hereinbefore referred to as constituting the fourth part of my invention, the brake rod, or the lower end of the brake rod, (to the upper end of which the brake lever is jointedly connected) is wormed, and takes through a split and partly inside screwed cap or screw box, forming, with lugs extending from the sides of it, an adjustable clip, and which said screw box takes and fits upon the upper and split end, of a brake tube whose lower end carries the brake block, spoon or other wheel retarding means.

Thus, the elements employed in connection with the adjustable means as aforesaid, consist of a screwed brake rod, taking through an adjustable clip, which is preferably clamped upon the plain and split upper end of a brake tube.

Figure 20 represents, in side elevation, a safety bicycle, provided or fitted with an adjustable brake made according to my invention.

Figure 21 represents a front elevation of that part of the brake containing my improvements.

Figure 22 represents an elevation of Figure 21, but with the same turned round at right angles.

The said Figure 21 shows the band drawn to by a thumb screw, and it also shows the split upper end of the brake tube.

Figure 23 represents a vertical section of the adjustable part of the brake rod.

Figure 24 represents a cross section of the brake rod adjustment means upon the dotted lines x—x Figure 21.

Figure 25 shows the parts of the adjustment means separately.

a is the brake rod, with its lower end a^2, wormed, and with its upper end a^1, bifurcated and jointedly connected to the brake lever b, and with the said wormed end taking down the open and cross split end d^2, of the brake tube d, whose upper end is fitted with a cap clip c, split down one side at c^2, and with the crown part c^1, inside screwed and with the lower part plain chambered at c^3, so as to fit upon the plain open end d^3, of the top d^2 of the brake tube d. This said lower part c^3, has a divided or split lug c^4, through plain and screwed holes c^5, c^6, in which, a tightening screw pin e, passes.

Now assuming that an adjustment is required to be made in the length of the brake rod, or that the distance between the brake block and the connection with the handle is required to be changed, first loosen the clamping clip c, by unscrewing the pin e, when the inside screwed crown part is loosened.

Now rotate the screw box upon the wormed part of the brake rod to the desired extent relative to the necessary adjustment. Then place the rod down the split end of the brake tube, with the cap clip upon the end of it, then turn the screw pin when the split parts of the cap are drawn together upon the rod and end of tube, hence the affixing of the whole of the said component parts rigidly together in their newly adjusted positions.

Figure 26 represents a modified form of adjustable brake rod or fitting.

In this form of my invention, the brake rod is made tubular, and that part of the device which carries the brake is made in the form of a rod.

Figure 27 represents a section of the adjustable middle part of the same.

Figure 28 represents a cross section upon the dotted lines A Figure 26.

In Figures 26 27 and 28, a is a hollow brake rod, connected at its upper end to the brake lever, and having its lower end cross slit at a^1, within which, the upper end d^2, of a rod d, passes, and is clamped in any adjusted position by a screw pin e, passing through a loose and split lugged clip c, surrounding the said split part a^1, as aforesaid.

By outwardly screwing the pin e, the parts are loosened and admit of sliding one upon another or one within the other, and after adjustment, the screwing home of the pin fixedly secures (by clamping) the whole of the parts together.

My invention in respect of driving chain relates to the rivet parts of the same and has for its object, the hardening of the whole of the said rivets less those parts requiring to be left malleable or soft for rivetting, that is to say, this part of my invention consists in leaving malleable or soft or the original metal intact, the end portions of hardened steel rivets, thus dispensing with the use of hardened steel casings as now employed.

By my invention, the wearing properties of the rivets are greatly increased, and the same, when fitted, are prevented from rotating.

In carrying out the process of leaving soft or malleable portions of the said rivets, I subject the whole of them, less the end parts which are to be left soft or malleable, to the action of heat or flame, and with those parts to be left soft protected by a screen or shield, and when the parts to be hardened are sufficiently heated, the same are immersed in a suitable liquid, hence the hardening, with those portions not brought under the action of the heat or flame left intact, or malleable or soft.

I prefer to effect the heating by flame jets, with or without blast.

The ends thus left soft or malleable are shouldered or cross faceted or squared, which ends take into like shaped holes in the chain links.

Figure 29 represents a length of chain having rivets with hardened bodies, and with their ends left soft and in a condition suitable for expanding by rivetting.

Figure 30 represents, in perspective, a knife edged rivet with unshouldered ends, which are left soft.

Figure 31 represents a soft-ended and shouldered rivet.

Figure 32 represents a plain rivet, with the ends left soft and the middle part hardened to resist wear.

In the sixth part of my invention in connection with attachable and detachable mud guards, or other loose framings, which at times it may be desirable to remove when not required to be used, I employ in connection with the said mud-guards or the like, detachable clips.

Thus, in applying this part of my invention in connection with the mud guard of a back wheel, I provide the back framing, or the back of a diamond framing, which is composed of two sides, coming together, but having a distance between them greater than the breadth of the wheel and of the mud guard, with cross struts or cross ties, consisting essentially of bars, around which, attachment clips, as hereinafter described, carried by the mud guard, come.

Thus the members of each side of the framing or the back stays, the one directed obliquely from the bottom bracket, and the other from the seat, and both terminating at the same point at the rear, are provided at points between the said sides, with cross struts.

Now the guards are fitted with attachment clips, each consisting of a thin sheet steel clip or band clip, with the ends made solid, and wherethrough a drawing-up screw pin passes. The crowns of the said clips have ears or flanges for the attachment of the said clip to the mud guard, or to the stays of the same at suitable points.

The attachment band clips are preferably made from cruciform blanks, subsequently fashioned into the desired clip form.

In affixing a mud guard, place the clips around the struts or cross ties coming between the frame members, or around the frame members themselves. Then pass the screw through the terminal ends of the band clip, and screw the same home, when the necessary attachment is made.

To remove the mud guard, loosen and take out the screw, when the guard and attachment are drawn from off the struts and come away together.

Figure 33 represents a safety bicycle, having a detachable mud guard provided with attachments made according to this invention.

Figure 34 represents a cross section of a portion of the wheel and mud guard and the band clip attachment fitted thereto.

Figure 35 represents a cross section of Figure 34 upon the dotted lines x—x.

a is a wheel, b is a mud guard, c are back stays and d are cross struts. e is a band clip, with the free ends drawn together by a screw pin f, and with the crown of the said clip having made fast with it, a bracket attachment e^1, which is secured by brazing or rivetting to the guard b, whilst the band clip e, circumferentially embraces the strut.

In the seventh part of my invention relating to the chain adjustment means at the ends of the back forks, I fit both sides of the said back forks with adjustment means, each consisting of a propelling and repelling screw, terminated at its inner end by a spindle bearing, or a ring, wherethrough the spindle passes, and with the inside face of the said bearing ring or plate having ribs, lugs or feathers, which take within like-shaped longitudinal channels or grooves, formed within or directed along the branched members of the fork ends.

By the lugs on the bearings taking and sliding within the channels or grooves directed along the sides as aforesaid, the branches are prevented from opening out.

Fitted within the ends of the said branches are cross bars, having plain bearings or eyes through their middles, wherethrough the adjustment or tightening-up screws pass, and at the back of them, the adjustment nuts or screw turns, taking upon the ends of the said screws, abut and take their bearings.

Figure 36 represents a front elevation of one of the said adjustment ends of the back forks, with a portion of the rear stay.

Figure 37 represents the fork end separately, with the tightening-up screw pin and other loose parts of the device removed.

Figure 38 represents a section of one of the branches upon the dotted lines x—x Figure 37.

Figure 39 represents an inside view of an end elevation of the tightening up pin with its spindle bearing, showing the dispositions of the square lugs or studs, which take within the channels or grooves upon the inner sides of the branches of the bifurcated ends.

In Figures 36 to 39, a is a bifurcated end of the back forks, having branches a^1, a^1, separated from each other by a gap or opening a^2 and with the branches a^1, having lugs a^3, into or upon which the fork and rear stay members a^4, a^5, take. b is the spindle bearing, consisting of a plate b^1, pierced in its middle with an opening b^2, for receiving the spindle end, and having upon its inner face, lugs or ribs b^3, which take within longitudinal channels or sinkings a^6, formed longitudinally within the branches a^1, by means of which the said branches are tied or stayed, and prevented from opening out.

The said spindle bearing is propelled and repelled for adjustment, by a screw pin b^4, carried by the said bearing b, and with the same located between the branches of the bifurcated ends of the forks, and passing through the bearing hole d^1, of a cross bar d, located at and coming up to the ends of the branches a^1, and with an adjustment nut e, coming at the back of the cross bar and taking upon the screw pin. Instead of the ribs snugs or feathers being upon the bearing plates, they may be upon the branches of the forked ends, whilst the channels to receive the ribs are sunken within the bearing plates.

In the eighth part of my invention relative to pneumatic tyre inflators, which are carried by, and form an accessory to, a machine, I provide the said instruments with a means for preventing the inner tube or piston rod (when the same is being carried or out of use) from coming out of the outer one, or the barrel from coming from over the inner tube or piston rod, (where one is employed).

The said means may consist of a turn-round or turn-down catch, spring catch or detent, or a screw turn, which ties or connects the one part to the other, or otherwise prevents the one part from moving within or over the other part, when the inflator is out of use.

Figure 40 represents a pump fitted with one form of the aforesaid means for securing the inner tube or rod within the barrel part, so as to prevent the one coming from out of or from over the other.

Figure 41 represents a like view as Figure 40, but with the shank end of the piston detached and slightly drawn out from the cap end of the barrel.

In Figures 40 and 41, a is the hollow piston rod or inner tube, having at the junction of its shank end a^1, with the finger grips b, a screwed collar a^2, adapted to take within a like sinking or mouth c^2, at the entrance to the piston rod hole c^1 of the cap c, which is secured to the rear end of the barrel c^3. b^1 is a flexible connection.

The barrel part c^3, forms the handle (when the fingers are placed behind the finger grips b) by means of which the instrument is worked.

Assuming that the pump is out of use and requires to be carried, then the barrel c^3, is rotated, when the screw collar a^2, is at the entrance to the screwed sinking c^3, by means of which the one part is screwed into or upon the other part.

Figure 42 represents a pump fitted with a further form of piston-rod retaining means constructed according to this part of my invention.

a is the hollow piston, up which air is forced to the connection b^1. b are the finger grips, and c is the cap, having formed within it, a bayonet slot c^2, which takes over and engages with the pin a^2, carried by the collar at the junction of the inner tube with the grips.

To lock the inner tube to the barrel, bring the entrance to the bayonet slot opposite to the pin, then slide the one into the other, or the one over the other, and rotate one of them.

Figure 43 represents a still further form of this part of my invention.

In this arrangement, the lock is formed by or through the medium of a spring catch or detent.

a is a hollow piston rod, surmounted by a finger grip or holder b, and working through the cap c, of the barrel c^3, and with the termination of the rod having a flexible connection b^1, as usual. The cap c, carries a spring catch a^2, having a stud or swell a^3, upon its underside, and jointedly connected to the cap by the rivet a^4.

On the line of the axis of the pump, and in the middle of the finger grip b, is a sinking c^2, for receiving the swell a^3.

When the pump is not in use, the catch a^2, is turned into the position as represented by the dotted lines, and with the swell or stud a^3, taking into the sinking c^2.

On the other hand, when the pump is required to be used, then the catch is turned aside into the position represented by the said Figure 43.

Instead of the catch swivelling upon a pin, it may turn down upon a hinge.

In carrying out one form of that part of my invention relating to power-working inflators, I take an ordinary barrel or casing, and provide the interior of the same with a double-headed piston or plunger, or two connected together piston heads which heads are connected together by a body part in the form of a reciprocating slide, having a row of stud teeth directed up the middle of one side of it, whilst surrounding these said stud teeth is a continuous groove or path, in which the bearing end of a pinion (operated by a lever, winch handle or its equivalent), engaging with the rack studs, takes.

The slide which carries the rack and the pistons may be fitted with rollers so as to reduce the frictional contact between the moving parts and the inside of casing.

The outer end of the axis of the pinion is provided with a suitable fixed bearing, so that on the said pinion being rotated through the lever or handle, the double piston or plunger, or the slide with double piston ends, is reciprocated, whilst the groove or path surrounding the rack teeth is continuously drawn or moved over the inner end of the pinion axis, and on the end studs of the rack completing their traverse, the axis of the pinion then moves from one side of the rack to the other, and this may be accomplished by the bearing of the pinion being formed within sliding blocks, working between cross guides, so as to admit of the pinion first operating upon one side of the rack, and then on the other by the lateral sliding of the said pinion at the end of each traverse.

Figure 44 represents a complete longitudinal vertical section of a double-acting power air pump, constructed, arranged and operated according to my invention.

The bearing bracket and also a part of the operating winch handle is removed, in order to show more clearly the working parts of the pump.

Figure 45 represents a complete longitudinal vertical section of the said pump upon the dotted lines $x—x$ Figure 44, with the top portion of the bearing bracket (hereinafter described) shown in its place.

Figure 46 represents a cross section of the pump upon the dotted lines A Figure 45.

Figure 46^A represents an underside view of the bracket with the rack pinion, sliding block and other local cognate parts of the mechanism of the pump.

Figure 47 represents, upon an enlarged scale, the passages and their valves, which form leads from the branches to the trunk air outlet.

Figure 48 represents, upon an enlarged scale, one of the inlet and check valves at either end of the cylinder or casing.

Figure 49 represents a transverse section upon the dotted lines B Figure 45, showing the section of the barrel and also the plunger, whose middle part has a row of rack teeth standing from it.

In Figures 44 to 49, a is a cylindrical barrel or casing, with closed ends a^1, a^2, each fitted with inlet and check valves b, c, and provided with an end cap a^3 at one end, fitted with a handle a^4, and having an air inlet a^5, to an inner chamber a^6. The other and rest end of the pump has a hollow foot spike a^7, with air inlet holes a^8, leading to the interior a^9, which forms a chamber at the back of the combined inlet and check valve c. Located at, and directed into, the ends of the interior of the barrel, are the inlets d^1, e^1, of branch delivery pipes d, e, leading to the trunk delivery outlet f, each of which said delivery pipes d, e, are provided at their junctions with the pipe of the trunk f, with check valves d^2, e^2.

Located and working reciprocally within the middle part of the hollow interior of the barrel, is a double plunger, or a double-headed or double-ended plunger g, having ends or heads g^1, g^2, fitted with cup leathers h, h^1, working freely within the interior of the barrel. The plunger or half-plunger body g^3, has a flat side g^4, up the middle of which is a row of outstanding rack teeth i, surrounded by a continuous channel or groove j, which forms a guide-race and clearance for the end k^1, of the axis k^2, of the pinion k, which said axis or spindle k^2, passes through a sliding guide block k^3, working within the walls m^2, of a transverse slot m^1, of a fixed bracket m, secured to the middle of one side of the barrel of the pump.

The outer end of the spindle carries a winch handle k^4, the rotation of which turns the pinion, which intergears with the stud teeth of the rack and by it the pinion is reciprocated to and fro, and as the end teeth i^1, i^2, of the rack pass the pin, then the pinion rolls over the said end teeth and passes from one side of the row of rack teeth to the other, by the lever or winch, with its sliding block bearing k^3, moving bodily across the path of the rack and double plunger, through the medium of the cross slot.

OPERATION.

Assuming that the pump is placed upright, with its foot spike resting upon the ground, then by turning the winch handle forward, or from left to right, when the parts are in the position as represented in Figure 44, the double-ended plunger will be slid in the direction of the full arrow, when the valve b, will be closed and the air contained within the forward or top end of the barrel, or the chamber o, at the front of the piston, will be forced through the inlet of the delivery passage d, up the said passage d, past the valve d^2, and up the trunk delivery pipe f, either to the object to be inflated or to a store.

The transposition of the piston from the lower to the upper end of the barrel, causes air to be drawn into the lower part or chamber p, of the barrel, through the lower valve c, which is open, and at the same time the check valve e^2, is closed, partly by the back pressure of the air passing up the trunk and partly by the sucking action.

Now assuming that the double ended plunger has made its upward or forward traverse, and that the teeth of the pinion are meshed with the stud i^2, of the rack, then the continued movement of the winch handle, will make the end k^1, of the spindle k^2, take along the returned end j^1, of the groove or channel j, and so get to the other side of the row of rack teeth, by the pinion and bearing block k^3, sliding within the cross groove in the bracket, hence the transposition of the pinion from one side of the row of rack teeth to the other, and by it, a continuous reciprocating movement is imparted to the piston by the continued rotation of the winch handle.

The return movement of the double ended plunger closes the valve *c*, opens the valve *b*, forces the compressed air through the delivery pipe *e*, opens the valve e^2, and closes the valve d^2, in the same way as before.

In a further form of this part of my invention, the studs of the rack may be arranged to take a course after the fashion of an endless band, that is, the slide is provided with an endless path of studs, with the channel for receiving the spindle end coming between the opposite racks.

In a modified form of the first described arrangement of power air pump, in which a single row of rack teeth is employed, I take an ordinary barrel or cylinder and fit the interior of the same with a reciprocating and double-headed piston or plunger, as before, the heads of which may be separated by a rack-toothed stalk or rod, with the teeth of which, a pinion on the axis of a toothed wheel engages. Also alternately intergearing with the said toothed wheel are two shifting pinions, which respectively and alternately intergear with a pinion or toothed wheel upon an axis, to which an arm, lever or winch handle is connected.

The first named toothed wheel has a stud upon its face or projecting from its periphery, beyond and without the plane of its teeth, and the said stud is for the purpose of throwing the shifting pinions alternately into and out of gear on each reciprocation of the double piston.

By now rotating the crank or winch handle after the manner of a windlass, motion is imparted to the pistons through one or other of the shifting pinions, the toothed wheel, the rack pinion and the rack.

In that part of my invention relating to spanners for cycles and the manufacture or production of them, I make the handle and fixed jaw parts up of two longitudinal and hollow sectional parts, which, when brought together, with the hollow of the one part adjacent to and coincident with the hollow of the other part, form a flattened and hollow spanner body part with fixed jaws, on the rivetting together of the said halves or longitudinal sectional parts.

The said flat tubular-shaped hollow body part is open at its jaw end, and down or within the hollow middle of which, the shank of the movable jaw slides and works, whilst a lower end of the shank of the movable jaw or head is wormed upon which a screw box or screw nut fitted within and working through a piercing cut within the middle part of the spanner engages, so that by rotating the said nut, which extends slightly beyond the outside walls of the sides as aforesaid, the movable jaw is propelled and repelled, and the distance between the jaws thereby adjusted.

Figure 50 represents a spanner made according to one form of this part of my invention. The body or handle and fixed jaw parts are made up of two shells or sides, with the hollows placed together, so as to form a hollow and flat body part.

Figure 51 represents an edge view of the same.

Figure 52 represents a vertical section upon the dotted lines *x*—*x* Figure 51, but with the movable jaw and screwed shank in elevation.

Figure 53 represents a vertical section at right angles to the section of Figure 52 and upon the dotted lines A B of the said last-named figure.

Figure 54 represents the component parts of the spanner separately.

Figure 55 represents a cross section upon the dotted lines *x*—*x* Figure 52.

In Figures 50 to 55, *a* is the combined handle and fixed jaw, or the body part of the spanner, which is composed of two halves or sectional shell parts a^1, a^1, and hollow parts a^2, a^2, and solid boundary edges or walls a^3, a^4, the latter constituting, in each case, one half of the solid jaw. These hollow sectional parts are placed with the hollows face to face and are then permanently affixed together by cross pins or rivets a^5, thereby forming a hollow spanner body part, within the interior of which, the shank and screwed stalk b^1, b^2, surmounted by the movable jaw or head *b*, slides, and with the said stalk part taking through a nut *c*, located within a cross opening a^6, formed within the shell sides of the body part *a*.